TIME SPEED DISTANCE

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1) A person traveled from his house to office at 30 kmph then he was late to his office by 5 minutes. If he increases his speed by 10 kmph. He would be early by 15 minutes to his office. What should be his speed so that he reaches his office on time?

a) 36 kmph b) 32 kmph ✓ c) 34 kmph d) 35 kmph.

Distance b/w house to office = x kms

speed to travel to reach on time = y km/hr.

Reaching time from house to office = $\frac{x}{y}$ hrs

$$\frac{x}{30} - \frac{x}{y} = \frac{5}{60}$$

$$\frac{x}{30} - \frac{x}{y} = \frac{1}{12} \quad -(1)$$

$$\frac{x}{y} - \frac{x}{40} = \frac{15}{60}$$

$$\frac{x}{y} - \frac{x}{40} = \frac{1}{4} \quad -(2)$$

Add (1) & (2)

$$\frac{x}{30} - \frac{x}{y} + \frac{x}{y} - \frac{x}{40} = \frac{1}{12} + \frac{1}{4}$$

$$\frac{x}{30} - \frac{x}{40} = \frac{1+3}{12}$$

$$\frac{(4-3)x}{120} = \frac{4}{12}$$

$$\frac{1x}{120} = \frac{4}{12}$$

$$x = \frac{4 \times 120}{12}^{10}$$

$$\boxed{x = 40}$$

Substitute in (4)

$$\frac{40}{30} - \frac{40}{y} = \frac{5}{60}$$

$$\frac{4}{3} - \frac{40}{y} = \frac{1}{12}$$

$$\frac{4}{3} - \frac{1}{12} = \frac{40}{y}$$

$$\frac{16-1}{12} = \frac{40}{y}$$

$$\frac{15}{12} = \frac{40}{y} \Rightarrow \frac{5}{4} = \frac{40}{y}$$

$$5y = 160$$

$$y = \frac{160}{5}$$

$$\boxed{y = 32 \text{ kmph}}$$

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2) A train 575 m long crosses a tunnel of length 325 in 90 sec. What is the speed of the train in kmph.

a.) 28 b) 32 c.) 36 d.) 24

$SP = \frac{D}{T} = \frac{575+325}{90} = \frac{900}{90} = 10$ m/s

m/s → km/hr ⇒ $10 \times \frac{18}{5} = \frac{180}{5} = 36$ kmph

3) A train which has 390 m long, is running 45 kmph. In what time will it cross a person moving at 9 kmph in same direction

a.) 26 sec b.) 39 sec c.) 36 sec d.) 29 sec.

Speed of Train = 45 kmphr

Speed of person = 9 kmphr

Relative speed (v) = 45+9 = 54 kmph

v in m/s ⇒ $54 \times \frac{5}{18} = \frac{270}{18} = \frac{90}{6} = 15$ m/s

d = 390 m

$SP = \frac{D}{T}$

$T = \frac{D}{S.P} = \frac{390}{15} = 26$ sec

4.) Two persons start running simultaneously around a circular track of length 400 m from the same point at speeds of 15 kmph and 25 kmph. After will they meet for the first time any where on the track if they are moving in the opposite direction?

a.) 144 b) 36 c.) 124 d.) 32

$t = \frac{\text{length of track}}{\text{relative speed}}$

$SP = \frac{D}{t}$

$t = \frac{D}{SP} = \frac{400}{(25+15)} = \frac{400}{40} = 10$ ~~seconds~~

$\Rightarrow \frac{10}{\frac{5}{18}} \Rightarrow \frac{10 \times 18}{5} =$

$10 \times \frac{18}{5} = 36$ sec

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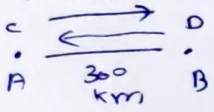
5) Two person C & D started traveling from A and B which are 300 km apart, towards B and A respectively at 1.00 p.m. C travels at a constant speed of 30 Kmph. whereas D doubles his speed for every hour. If D reaches a in 4 5/8 hours at what time C and D meet each other.

a) 4:30 pm b) 4:40 pm c) 5:00 pm d) 5:10 pm



D → Doubles speed for every hour.

D reaches A → $4 + \frac{5}{8}$ hours = $\frac{37}{8}$ hours.

D's initial spee d = d

$d + 2d + 4d + 8D + 16d(5/8) = 300$

$d + 2d + 4d + 8d + \frac{80d}{8} = 300$

$d + 2d + 4d + 8d + 10d = 300$

$25d = 300$

$d = 12$

T	C	D	Total
1	30	12	42
2	60	12+24 = 36	96
3	90	36+48 = 84	174
4	120	84+96 = 180	300

They will meet each other after 4 hours.

1:00 pm + 4:00 hrs = 5:00 pm

6) Two trains T_1 and T_2 start simultaneously from two stations x and y respectively towards each other. If they are 70 km apart both 3 and 6 hours after start, then find the distance b/w the two stations.

a) 210 km b) 240 km c) 220 km d) 180 km.

$SP = \frac{d}{t} \Rightarrow d = SP \times t$

SP of T_1 = u km/hr

SP of T_2 = v km/hr

$(u+v)3 = d - 70$ — ①

$(u+v)6 = d + 70$ — ②

divide ② by ①

$\frac{(u+v)6}{(u+v)3} = \frac{d+70}{d-70}$

$2(d-70) = 1(d+70)$

$2d - 140 = 1d + 70$

$1d = 210$

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7) Ajith and Rana walk around a circular course 115 km in circumference, starting together from the same point. If they walk at speed of 4 and 5 kmph respectively, in the same direction, when will they meet?

a) After 20 hours b) after 115 hours c) after 115 minutes
d) After 20 minutes.

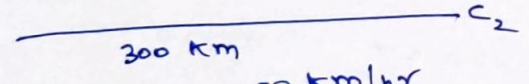
Speed of A = 4 km/hr
Speed of B = 5 km/hr
difference = 5 - 4 = 1 km/hr b gains more than A.
Relative speed = 1 km/hr.

circumference = 115 km

$SP = \frac{D}{t} \Rightarrow t = \frac{D}{SP} = \frac{115}{1} = 115$ (After)

8) There are 4 people who has to cross a stretch of 300 km. They normally run at a speed of 10 kmph. one of them has a bike that travels at 50 kmph. The bike first takes one person alone and crosses the stretch while the other two keep running. Then the comes back without wasting time and picks up another person from the way, drives him across the stretch, and does the same for the last person. How long does this whole process take this?

a) 24 hrs b) 16 hrs c) $\frac{56}{3}$ hrs d) $\frac{58}{3}$ hrs.



A ride Bike = 50 km/hr B, C, D → walk = 10 km/hr

A and B travel at first = $\frac{300}{50}$ = 6 hours

Till this time C covered distance of = 6 × 10 = 60 by walk

distance left for C = 300 - 60 = 240

Time to meet C = $\frac{240}{50+10} = \frac{240}{60}$ = 4 hrs

Till now time taken = 6 + 4 hours = 10 hours

In the returning 4 hrs C travel 40 km

total C travel = 60 + 40 = 100 kms

C to carry = $\frac{300-100}{50} = \frac{200}{5}$ = 4 hrs

D travel = 100 + 40 km = 140 km.

D in bike = $300 - 140 / (50+10) = \frac{160}{60} = \frac{8}{3}$ hrs

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total time

$6 + 4 + 4 + \frac{8}{3} + \frac{8}{3}$

$14 + \frac{8}{3} + \frac{8}{3}$

$\frac{42 + 16}{3}$

$= \frac{58}{3}$

9.) Ragav took a bus from home to market, that travels at 40 kmph while walking back at 4 kmph, half way through, he suddenly realized he was getting late and he cycled back the remaining distance in 30 kmph. Find the average speed.

a.) 6.5 kmph b) 12.0 kmph c.) 28.5 kmph

d.) none of these

let distance from Home to market = $2x$

$SP = \frac{d}{t}$

1st travel in BUS = $\frac{2x}{40}$ hrs

Return by walk = $\frac{x}{4}$ hrs

Return by cycle = $\frac{x}{30}$ hrs.

L.C.M 3, 15, 2

Total time = $\frac{2x}{40} + \frac{x}{4} + \frac{x}{3}$

$= \frac{6x + 30x + 4x}{120}$

$= \frac{40x}{120}$

Assume $x = 60$ mins for this 1 hr

Avg speed = $\frac{2x + x + x}{\frac{40}{4}\ \frac{30}{2}}$

$= \frac{6x + 30x + 4x}{120}$

$= \frac{40x}{120}$

Avg speed = $\frac{\text{Total distance (T.d)}}{\text{Total time}}$

T.d = $4x$

Total time = $\frac{40x}{120}$

$\Rightarrow \frac{4x/1}{40x/120} \Rightarrow \frac{4x}{40} \times 120$

Avg. Speed = 12

Total distance = $4x$ (or)

$x = 60$ (ASSUME)

$$\frac{\text{Total distance}}{\text{Total Time}} = \text{Avg speed} = \frac{2v_1v_2}{v_1+v_2} = \frac{2(30)(4)}{30+4}$$

$$= \frac{240}{34}$$

Avg speed of return (v_1) $= \frac{120}{17}$

$$\text{Total Avg speed} = \frac{2\left(\frac{120}{17}\right)(40)}{\frac{120}{17}+40} = \frac{80 \times \frac{120}{17}}{\frac{120+680}{17}}$$

$$= \frac{\frac{9600}{17}}{\frac{800}{17}} = \frac{9600}{800} = 12$$

10) Two trains of equal length 120 meters move in the same direction. The faster train completely overtakes the slower one in 15 seconds. If the slower train were to move at half speed, the overtaking would take in 10 seconds. At what speeds are the 2 trains moving (faster and slower respectively in m/s)

a) 24, 22 b) 32, 16 c) 30, 18 d) 28, 14

Total length of 2 trains = 120 + 120 = 240

Relative speed first case I $\Rightarrow x - y = \frac{240}{15}$

$x - y = 16$ — (1)

CASE II Relative speed

$x - 0.5y = \frac{240}{10}$

$x - 0.5y = 24$ — (2)

$2x - 2y = 32$

$2x - y = 48$ (−)

$-y = -16$

$y = 16$

$x - y = 16$

$x - 16 = 16$

$x = 16 + 16$

$x = 32$